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Revision history		
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001	01/05/2025	First Issue
002	13/05/2025	Document number corrected

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Customer:	CrossWind C.V., Rotterdam, The Netherlands

SPC ID 0203 Pipework inspection and leakage test check sheet

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Revision Record

Rev #	Description	Revised By	Date dd-mm-yyyy
-	Initial Draft	TAN	21-08-2024
1	Released	TAN	30-8-2024

Checked by: MHA	Date: 29/08-2024
Approved by: MHA	Date: 30/08-2024

Project	601456B Crosswind BLPH
Date	30-08-2024
Identification of piping system (photo or P&ID) [✓ or -]	✓
Inspected by	MKD
Document Approved by	MFO
Filing date	02-09-2024

Follow the procedure in section 5.4 of *SPC ID 0104 Leakage Test Procedure*

*=Pass criteria according to inspection tool user instruction

**=Calculated value based on expected leakage rate plus sniffing tool uncertainty

*** Not applicable due to refitting/preswaging of joint/Not a ferrule fitting

		Visual inspection	Gauge Inspection*	Auditorial inspection	Sniffing inspection		Overall result
Item type	**Item ID**	**Pass/fail**	**Pass/fail**	**Pass/fail**	**Pass/fail**	**Pass criteria** [PPM]**	**[Pass/fail]**
H2 Heater+Container, String 1	1-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 Heater+Container, String 1	1-C-CUR-1	✓	NA***	✓	✓	35ppm	✓
H2 Heater+Container, String 2	2-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 Heater+Container, String 2	2-C-CUR-1	✓	NA***	✓	✓	35ppm	✓

H2 Heater+Container, String 3	3-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 Heater+Container, String 3	3-C-CUR-1	✓	NA***	✓	✓	35ppm	✓
H2 Heater+Container, String 4	4-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 Heater+Container, String 4	4-C-CUR-1	✓	NA***	✓	✓	35ppm	✓
H2 Heater+Container, String 5	5-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 Heater+Container, String 5	5-C-CUR-1	✓	NA***	✓	✓	35ppm	✓
H2 Heater+Container, String 6	6-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 Heater+Container, String 6	6-C-CUR-1	✓	NA***	✓	✓	35ppm	✓

H2 Heater+Container string 1,2,3,4,5,6



M: Manifold
H: Heater
C: Container
BV: Ball Valve
MANO: Manometer
PRV: Pressure Relief Valve
CUR: Reducing Union
CTR: Reducing Tee
CMC: Male Connector
CLA: Union Elbow
CTA: Union Tee
CSWC: Tube Socket Weld Connector
CPA: Plug
Red Arrow indicates inspected item.

H2 Container pipe to FCwave



M: Manifold
H: Heater
C: Container
BV: Ball Valve
MANO: Manometer
PRV: Pressure Relief Valve
CUR: Reducing Union
CTR: Reducing Tee
CMC: Male Connector
CLA: Union Elbow
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CSWC: Tube Socket Weld Connector
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SPC ID 0203 Pipework inspection and leakage test check sheet

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Filing date	02-09-2024

Follow the procedure in section 5.4 of *SPC ID 0104 Leakage Test Procedure*

*=Pass criteria according to inspection tool user instruction

**=Calculated value based on allowable leakage rate plus sniffing tool uncertainty

*** Not applicable due to refitting/preswaging of joint/Not a ferrule fitting

		Visual inspection	Gauge Inspection*	Auditorial inspection	Sniffing inspection		Overall result
Item type	**Item ID**	**Pass/fail**	**Pass/fail**	**Pass/fail**	**Pass/fail**	**Pass criteria** [PPM]**	**[Pass/fail]**
H2 heater, String 1	1-H-BV-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 1	1-H-CLA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 1	1-H-CMC-G-1	✓	✓	✓	✓	35ppm	✓

H2 heater, String 1	1-H-CMC-G-2	✓	✓	✓	✓	35ppm	✓
H2 heater, String 1	1-H-CMC-G-3	✓	✓	✓	✓	35ppm	✓
H2 heater, String 1	1-H-CMC-G-4	✓	✓	✓	✓	35ppm	✓
H2 heater, String 1	1-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 2	2-H-BV-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 2	2-H-CLA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 2	2-H-CMC-G-1	✓	✓	✓	✓	35ppm	✓
H2 heater, String 2	2-H-CMC-G-2	✓	✓	✓	✓	35ppm	✓
H2 heater, String 2	2-H-CMC-G-3	✓	✓	✓	✓	35ppm	✓
H2 heater, String 2	2-H-CMC-G-4	✓	✓	✓	✓	35ppm	✓
H2 heater, String 2	2-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 3	3-H-BV-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 3	3-H-CLA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 3	3-H-CMC-G-1	✓	✓	✓	✓	35ppm	✓

H2 heater, String 3	3-H-CMC-G-2	✓	✓	✓	✓	35ppm	✓
H2 heater, String 3	3-H-CMC-G-3	✓	✓	✓	✓	35ppm	✓
H2 heater, String 3	3-H-CMC-G-4	✓	✓	✓	✓	35ppm	✓
H2 heater, String 3	3-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 4	4-H-BV-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 4	4-H-CLA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 4	4-H-CMC-G-1	✓	✓	✓	✓	35ppm	✓
H2 heater, String 4	4-H-CMC-G-2	✓	✓	✓	✓	35ppm	✓
H2 heater, String 4	4-H-CMC-G-3	✓	✓	✓	✓	35ppm	✓
H2 heater, String 4	4-H-CMC-G-4	✓	✓	✓	✓	35ppm	✓
H2 heater, String 4	4-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 5	5-H-BV-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 5	5-H-CLA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 5	5-H-CMC-G-1	✓	✓	✓	✓	35ppm	✓

H2 heater, String 5	5-H-CMC-G-2	✓	✓	✓	✓	35ppm	✓
H2 heater, String 5	5-H-CMC-G-3	✓	✓	✓	✓	35ppm	✓
H2 heater, String 5	5-H-CMC-G-4	✓	✓	✓	✓	35ppm	✓
H2 heater, String 5	5-H-CUA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 6	6-H-BV-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 6	6-H-CLA-1	✓	NA***	✓	✓	35ppm	✓
H2 heater, String 6	6-H-CMC-G-1	✓	✓	✓	✓	35ppm	✓
H2 heater, String 6	6-H-CMC-G-2	✓	✓	✓	✓	35ppm	✓
H2 heater, String 6	6-H-CMC-G-3	✓	✓	✓	✓	35ppm	✓
H2 heater, String 6	6-H-CMC-G-4	✓	✓	✓	✓	35ppm	✓
H2 heater, String 6	6-H-CUA-1	✓	NA***	✓	✓	35ppm	✓

H2 Heater string 1,2,3 Inlet

M: Manifold
H: Heater
BV: Ball Valve
MANO: Manometer
PRV: Pressure Relief Valve
CUR: Reducing Union
CTR: Reducing Tee
CMC: Male Connector
CLA: Union Elbow
CTA: Union Tee
CSWC: Tube Socket Weld Connector
CPA: Plug
Red Arrow indicates inspected item.





H2 Heater string 4,5,6 Inlet



H2 Heater string 1,2,3,4,5,6 Shut-off Valve & Pipes

M: Manifold
H: Heater
BV: Ball Valve
MANO: Manometer
PRV: Pressure Relief Valve
CUR: Reducing Union
CTR: Reducing Tee
CMC: Male Connector
CLA: Union Elbow
CTA: Union Tee
CSWC: Tube Socket Weld Connector
CPA: Plug
Red Arrow indicates inspected item.





Short Title	**ATEX Inspection Checklist**
Full Title	**ATEX Inspection Checklist, 601456B Crosswind Hydrogen Manifold**
Abstract	-

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Revision Record

Rev #	Description	Revised By	Date
1	Initial Release	RBS	2. September 2024

Checked by: RBS	Date: Sept 2024
Approved by: PBL	Date: Sept 2024

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• Purpose and Scope

The purpose of this document is to provide a checklist for the Crosswind ATEX area containing the hydrogen manifold.

• References

Document	Name	Author
IEC 60079-17	Explosive atmospheres - Part 17: Electrical installations inspection and maintenance	IEC
JEVI 1953 861 100	Datasheet "Ex D-8640 Immersion Heater, 9kW 3x400VAC"	Sinus JEVI
	Datasheet "ASCO Solenoid Valves 210 series"	Emerson
	Datasheet "ASCO Solenoid NF series"	Emerson
	Datasheet "IFM LMT01A"	IFM
	Datasheet "HUBA 520 pressure sensor"	HUBA
	Datasheet "IFM TT1050-01"	IFM
	Datasheet "PR electronic 9202	PR electronic
	Datasheet "PR electronic 9113"	PR electronic
	Datasheet "PR electronic 9106"	PR electronic

- **Checklist:**

1.1 Hydrogen heater element

1.1.1 Test

The test is done accordingly to the test schematics in IEC 60079-17 Tabel C.1 following descriptions of the test will be below if applicable.

1.1.2 Relevant Standard / document

- IEC 60079-17
- JEVI datasheet 1953 861 100

1.1.3 Brief Test Plan

- Inspection will be done in respect to the datasheet, standards and Visual inspection prior to startup.

1.1.4 Pass/Fail criteria.

- The pass/fail criteria is specified for each inspection element is shown in Table 1.

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Table 1: Heater Inspection – Test Result

Item	Criteria	Result	Pass/Fail	Notes
Equipment is appropriate to the EPL/Zone requirement of the location	Gc or better	GB	✓	
Equipment group is correct	IIC	IIC	✓	
Equipment temperature class is correct	T1	T4	✓	
Degree of protection (IP grade) of the equipment is appropriate for the level of protection/group/conductivity	>IP55	IP66	✓	
Equipment circuit identification is correct	Present	✓	✓	
Equipment circuit identification is available	Yes	✓	✓	
Enclosure, glass parts and glass-to-metal sealing gaskets and/or compounds are satisfactory	NA	—	—	—
There is no damage or unauthorized modifications	None	none	✓	
There is no evidence of unauthorized modification	None	none	✓	
Bolts, cable entry devices (direct and indirect) and blanking elements are of the correct type and are complete and tight	Yes		✓	
Threaded covers on enclosures are of the correct type, are tight and secured	Yes		✓	
Joint surfaces are clean and undamaged and gaskets, if any, are satisfactory and positioned correctly	Yes		✓	
Condition of enclosure gaskets is satisfactory	Yes		✓	
There is no evidence of ingress of water or dust in the enclosure in accordance with the IP rating	No		✓	

Dimensions of flanged joint gaps are: – within the limits in accordance with the manufacturer's documentation or – within maximum values permitted by the relevant construction standard at time of installation or – within maximum values permitted by site documentation	—	—	—	—
Electrical connections are tight	Yes		✓	
Unused terminals are tightened	Yes		✓	
Type of cable is appropriate	Voltage and Environmental		✓	
There is no obvious damage to cables	No		✓	
Sealing of trunking, ducts, pipes and/or conduits is satisfactory	Not relevant	Not relevant	Not relevant	Not relevant
Stopping boxes and cable boxes are correctly filled	Yes		N/A	N/A
Integrity of conduit system and interface with mixed system maintained	No leaks			
Earthing connections, including any supplementary earthing bonding connections are satisfactory (for example connections are tight and conductors are of sufficient cross-section)	Inspection		✓	Gnd connected inside housing
Fault loop impedance (TN systems) or earthing resistance (IT systems) is satisfactory	<100mOhm	32mΩ	✓	
Automatic electrical protective devices are set correctly (auto-reset not possible)	Not present	Not present	Not present	Not present
Automatic electrical protective devices operate within permitted limits	Not present	Not present	Not present	Not present
Specific conditions of use (if applicable) are complied with	None	none	N/A	

Cables not in use are correctly terminated	Yes		✓	
Obstructions adjacent to flameproof flanged joints are in accordance with IEC 60079-14	Not present		N/A	
Variable voltage/frequency installation complies with documentation	Not present	Not present	Not present	Not present
Temperature sensors function according to manufacturer's documents	Not present	Not present	Not present	Not present
Safety cut off devices function according to manufacturer's documents	Inspected		✓	
The setting of the safety cut off is sealed	Yes		✓	
Reset of a heating system safety cut off possible with tool only	Yes		✓	
Auto-reset is not possible	Yes		✓	
Reset of a safety cut off under fault conditions is prevented	Yes		✓	
Safety cut off independent from control system	Yes		✓	
Level switch is installed and correctly set, if required	Yes (External to heater)		✓	
Flow switch is installed and correctly set, if required	NA		N/A	
Equipment is adequately protected against corrosion, weather, vibration and other adverse factors	Yes = X in product number	IP66 SS ect	✓	
No undue accumulation of dust and dirt	No		✓	

1.2 H2 Shut Off Valve

1.2.1 Test

The test is done accordingly to the test schematics in IEC 60079-17 Tabel C.1 following descriptions of the test will be below if applicable.

1.2.2 Relevant Standard / document

- IEC 60079-17
- Datasheet "ASCO solenoid valves 210 series"
- Datasheet "ASCO Solenoid NF series"

1.2.3 Brief Test Plan

- Inspection will be done in respect to the datasheet, standards and Visual inspection prior to startup.

1.2.4 Pass/Fail criteria.

- The pass/fail criteria are specified for each inspection element is shown in Table 2.

Table 2: Hydrogen Valve Inspection – Test Result

Item	Criteria	Result	Pass/Fail	Notes
Equipment is appropriate to the EPL/Zone requirement of the location	Gc or better	Gb	✓	
Equipment group is correct	IIC	IIc	✓	
Equipment temperature class is correct	T1	T4	✓	
Degree of protection (IP grade) of the equipment is appropriate for the level of protection/group/conductivity	>IP55	IP67	✓	
Equipment circuit identification is correct	Present		✓	
Equipment circuit identification is available	Present		✓	
Enclosure, glass parts and glass-to-metal sealing gaskets and/or compounds are satisfactory	Not applicable	Not applicable	Not applicable	Not applicable
There is no damage or unauthorized modifications	None		✓	
There is no evidence of unauthorized modification	None		✓	
Bolts, cable entry devices (direct and indirect) and blanking elements are of the correct type and are complete and tight	Yes		✓	
Threaded covers on enclosures are of the correct type, are tight and secured	No threaded cover	No threaded cover	No threaded cover	No threaded cover
Joint surfaces are clean and undamaged and gaskets, if any, are satisfactory and positioned correctly	Yes		✓	
Condition of enclosure gaskets is satisfactory	Yes		✓	
There is no evidence of ingress of water or dust in the enclosure in accordance with the IP rating	No		✓	

Dimensions of flanged joint gaps are: – within the limits in accordance with the manufacturer's documentation or – within maximum values permitted by the relevant construction standard at time of installation or – within maximum values permitted by site documentation	Tightened to 85 Nm on bonded seal connection	85 Nm	✓	
Electrical connections are tight	Yes		✓	
Unused terminals are tightened	Yes		NA	
Type of cable is appropriate	Voltage and Environmental		✓	
There is no obvious damage to cables	None		✓	
Sealing of trunking, ducts, pipes and/or conduits is satisfactory	Tightness – refer to leakage test		Leakage Passed ✓	
Stopping boxes and cable boxes are correctly filled	Not applicable	Not applicable	Not applicable	Not applicable
Integrity of conduit system and interface with mixed system maintained	Not applicable	Not applicable	Not applicable	Not applicable
Earthing connections, including any supplementary earthing bonding connections are satisfactory (for example connections are tight and conductors are of sufficient cross-section)	Inspection		✓	Gnd connected inside
Fault loop impedance (TN systems) or earthing resistance (IT systems) is satisfactory	<100mOhm	<40mΩ	✓	
Automatic electrical protective devices are set correctly (auto-reset not possible)	Not present	Not present	Not present	Not present
Automatic electrical protective devices operate within permitted limits	Not present	Not present	Not present	Not present
Specific conditions of use (if applicable) are complied with	X= stainless steel	Ok	✓	

Cables not in use are correctly terminated	Pass		✓	no loose cables
Obstructions adjacent to flameproof flanged joints are in accordance with IEC 60079-14	Not present	Not present	Not present	Not present
Variable voltage/frequency installation complies with documentation	Not present	Not present	Not present	Not present
Temperature sensors function according to manufacturer's documents	Not present	Not present	Not present	Not present
Safety cut off devices function according to manufacturer's documents	Not present	Not present	Not present	Not present
The setting of the safety cut off is sealed	Not relevant	Not relevant	Not relevant	Not relevant
Reset of a heating system safety cut off possible with tool only	Not relevant	Not relevant	Not relevant	Not relevant
Auto-reset is not possible	Not relevant	Not relevant	Not relevant	Not relevant
Reset of a safety cut off under fault conditions is prevented	Not relevant	Not relevant	Not relevant	Not relevant
Safety cut off independent from control system	Not relevant	Not relevant	Not relevant	Not relevant
Level switch is installed and correctly set, if required	Not relevant	Not relevant	Not relevant	Not relevant
Flow switch is installed and correctly set, if required	Not relevant	Not relevant	Not relevant	Not relevant
Equipment is adequately protected against corrosion, weather, vibration and other adverse factors	Yes = X in product number	Yes	✓	
No undue accumulation of dust and dirt	No		✓	

1.3 Sensing elements

1.3.1 Test

The test is done accordingly to the test schematics in IEC 60079-17 Tabel C.2 following descriptions of the test will be below if applicable.

1.3.2 Relevant Standard / document

- IEC 60079-17
- Datasheet "IFM LMT01A"
- Datasheet "HUBA 520 pressure sensor"
- Datasheet "IFM TT1050-01"
- Datasheet "PR electronic 9202"
- Datasheet "PR electronic 9113"
- Datasheet "PR electronic 9106"

1.3.3 Brief Test Plan

- Inspection will be done in respect to the datasheet, standards and Visual inspection prior to startup.

1.3.4 Pass/Fail criteria.

- The pass/fail criteria are specified for each inspection element is shown in Table 3.

Table 3: Sensing Elements – Test Result

Item	Criteria	Result	Pass/Fail	Notes
Circuit and/or equipment documentation is appropriate to the EPL/zone	Gc or better	Ga + Gb	✓	
Equipment installed is that specified in the documentation	Yes		✓	
Circuit and/or equipment category and group correct	Yes		✓	
IP rating of equipment is appropriate to the Group III material present	>IP55	IP67 IP66	✓	
Equipment temperature class is correct	T1	T4, T4	✓	
Ambient temperature range of the apparatus is correct for the installation	-10°C to +25°C		✓	
Service temperature range of the apparatus is correct for the installation	0°C to 40°C		✓	
Installation is clearly labelled	Yes			needs label on PT+LT
Enclosure, glass parts and glass-to-metal sealing gaskets and/or compounds are satisfactory	Not applicable	Not applicable	Not applicable	Not applicable
Cable glands and blanking elements are the correct type, complete and tight	Yes		✓	
There are no unauthorized modifications	None		✓	
There is no evidence of unauthorized modifications	None		✓	
Diode safety barriers, galvanic isolators, relays and other energy limiting devices are of the approved type, installed in accordance with the certification requirements and securely earthed where required	Yes		✓	

Condition of enclosure gaskets is satisfactory	Yes; if applicable	N/A	✓	
Electrical connections are tight	Yes		✓	
Printed circuit boards are clean and undamaged	Yes	N/A	N/A	N/A
The maximum voltage Um of the associated apparatus is not exceeded	Yes		✓	
Cables are installed in accordance with the documentation	Yes		✓	
Cable screens are earthed in accordance with the documentation	Yes		✓	
There is no obvious damage to cables	None		✓	
Sealing of trunking, ducts, pipes and/or conduits is satisfactory	Yes		N/A	
Point-to-point connections are all correct	Yes		✓	
Earth continuity is satisfactory (e.g. connections are tight, conductors are of sufficient cross-section) for non-galvanically isolated circuits	<100mOhm	<35mΩ	✓	
Earth connections maintain the integrity of the type of protection	Yes		✓	
Intrinsically safe circuit earthing is satisfactory	Yes		✓	
Insulation resistance is satisfactory	Yes		✓	
Separation is maintained between intrinsically safe and non-intrinsically safe circuits in common distribution boxes or relay cubicles	Yes			Partly
Short-circuit protection of the power supply is in accordance with the documentation	Yes		✓	

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Specific conditions of use (if applicable) are complied with			N/A	
Cables not in use are correctly terminated	Yes		✓	
Equipment is adequately protected against corrosion, weather, vibration and other adverse factors	Yes		✓	
No undue external accumulation of dust and dirt	Yes		✓	

Inspection performed by: RBS

Ballard Power Systems Product Solution

Date:

03/09-2024

Executed

30/08-2024